

CLAIMS

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1 1. An apparatus for providing a virtual volume, the apparatus comprising:
2 a plurality of disks;
3 a back-end controller coupled to the disks for organizing and presenting the
4 disks as a plurality of redundant arrays of disks; and
5 a front-end controller coupled to the back-end controller for striping the
6 redundant arrays of disks and presenting the striped arrays as a virtual volume.

1 2. The apparatus of claim 1 wherein the plurality of disks includes one or
2 more spare disks.

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1 3. The apparatus of claim 1 wherein the back-end controller includes a
2 plurality of busses, each coupled to one and only one of the disks associated with each
3 of the redundant arrays of disks.

1 4. The apparatus of claim 1 wherein the back-end controller comprises a
2 RAID engine for presenting the disks as a plurality of RAID sets.

1 5. The apparatus of claim 4 wherein the RAID engine comprises a RAID
2 engine for presenting the disks as a plurality of RAID-5 sets.

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1 6. An apparatus for providing a virtual volume, the apparatus comprising:
2 a plurality of disks;
3 a RAID engine coupled to the disks for organizing and presenting the disks as
4 a plurality of RAID sets; and
5 a striping engine coupled to the RAID engine for receiving the RAID sets as
6 members, striping the member RAID sets, and presenting the striped RAID sets as a
7 virtual volume.

1 7. The apparatus of claim 6 wherein the RAID engine comprises a
2 RAID-5 engine.

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1 8. An apparatus for providing a virtual volume, the apparatus comprising:
2 a plurality of back-end controllers, each configured to organize and present X
3 N-member RAID sets, and each having N busses capable of supporting X+1 disks
4 each;
5 a plurality of groups of X+1 disks, each group being coupled to one of the
6 back-end controller busses; and
7 a local front-end controller coupled to the back-end controllers for receiving
8 the RAID sets as members, striping the member RAID sets, and presenting the striped
9 RAID sets as a virtual volume.

1 9. The apparatus of claim 8 wherein the local front-end controller is
2 configured to generate mirror sets from the RAID sets received as members from
3 different back-end controllers, to stripe the mirror sets, and to present the striped
4 mirror sets as the virtual volume.

1 10. The apparatus of claim 8 wherein the plurality of back-end controllers
2 includes primary local, redundant local, cloning, primary remote, and redundant
3 remote back-end controllers.

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1 11. The apparatus of claim 8 further comprising a remote front-end
2 controller coupled to at least some of the back-end controllers for receiving RAID sets
3 as members, striping the member RAID sets, and presenting the striped RAID sets as
4 the virtual volume.

1 12. The apparatus of claim 11 wherein the remote front-end controller is
2 configured to generate mirror sets from the received RAID sets, to stripe the mirror
3 sets, and to present the striped mirror sets as the virtual volume.

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13. An electronic system comprising:
a computer; and
an apparatus coupled to the computer for presenting a virtual volume to the computer, the apparatus including:
a plurality of disks;
a back-end controller coupled to the disks for organizing and presenting the disks as a plurality of redundant arrays of disks; and
a front-end controller coupled to the back-end controller for striping the redundant arrays of disks and presenting the striped arrays as the virtual volume.

14. A method of storing data on a plurality of disks, the method comprising:
organizing the disks into a plurality of redundant arrays of disks;
striping the redundant arrays of disks together to form a virtual volume; and
writing the data to the virtual volume.

15. The method of claim 14 wherein the act of organizing the disks comprises organizing the disks into a plurality of RAID sets.

16. The method of claim 15 wherein the act of organizing the disks comprises organizing the disks into a plurality of RAID-5 sets.

17. The method of claim 14 wherein the act of organizing the disks includes:
providing one or more back-end controllers, each having a plurality of busses;
and
coupling the disks to the back-end controller busses so that each bus is coupled to no more than one disk from each redundant array of disks and each bus is coupled to a spare disk.

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